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FINAL ENGINEERING EVALUATION/COST ANALYSIS FOR A NON-TIME CRITICAL REMOVAL ACTION UNEXPLODED ORDNANCE 16 (UXO 16) ADJACENT TO CAYO LA CHIVA ATLANTIC FLEET WEAPONS TRAINING AREA FORMER VIEQUES NAVAL TRAINING RANGE VIEQUES ISLAND PUERTO RICO

11/01/2014

CH2M HILL

Final

Engineering Evaluation/Cost Analysis for a Non-Time Critical Removal Action UXO 16 Adjacent to Cayo La Chiva

Atlantic Fleet Weapons Training Area—Vieques
Former Vieques Naval Training Range
Vieques, Puerto Rico

Contract Task Order 005

November 2014

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Atlantic

Under the

NAVFAC CLEAN 8012 Program
Contract N62470-11-D-8012

Prepared by

CH2MHILL

Virginia Beach, Virginia

Contents

Appendix

Acronyms and Abbreviations

AC	Acres
ARAR	applicable or relevant and appropriate requirement
BIP	blow-in-place
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-term Environmental Action—Navy
CTO	Contract Task Order
DOI	Department of Interior
DMM	Discarded Military Munitions
DNER	Puerto Rico Department of Natural and Environmental Resources
Ea	Each
EE/CA	Engineering Evaluation/Cost Analysis
EMA	Eastern Maneuver Area
EOD	Explosive Ordnance Disposal
ERP	Environmental Restoration Program
IRP	Installation Restoration Program
km	kilometers
LS	Lump sum
LUCs	land use controls
MEC	munitions and explosives of concern
MPPEH	material potentially presenting an explosive hazard
NAVFAC	Naval Facilities Engineering Command, Atlantic Division
Navy	Department of the Navy
NCP	National Contingency Plan
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
NTCRA	non-time critical removal action
OP-5	Operational Procedures 5
PAOC	Potential Area of Concern
PREQB	Puerto Rico Environmental Quality Board
RAO	removal action objectives
RRD	range related debris
SARA	Superfund Amendments and Reauthorization Act
USEPA	U.S. Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UXO	Unexploded Ordnance
VNTR	Vieques Naval Training Range

SECTION 1

Introduction

This Engineering Evaluation/Cost Analysis (EE/CA) report presents the evaluation of interim removal action alternatives for a non-time critical removal action (NTCRA) to reduce the explosive hazard associated with nine potential munitions and explosives of concern (MEC)/ material potentially presenting an explosive hazard (MPPEH) identified immediately offshore of Cayo La Chiva in Unexploded Ordnance (UXO) 16, located at the former Vieques Naval Training Range (VNTR), Vieques, Puerto Rico (**Figures 1-1** through **1-3**). Cayo La Chiva is located in close proximity to Playa la Chiva (Blue Beach), a beach that is currently open to the general public for recreational use (**Figure 1-3**). This NTCRA will reduce the explosive hazard in the area associated with the nine items in the near-term, and ultimately support the final remedy selection for the site via the full Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process.

This document was prepared under the Naval Facilities Engineering Command, Atlantic Division (NAVFAC), Comprehensive Long-term Environmental Action—Department of the Navy (Navy) (CLEAN) 8012 Contract N62470-11-D8012, Contract Task Order (CTO) 005, for submittal to NAVFAC, the U.S. Environmental Protection Agency (USEPA) Region 2, the Commonwealth of Puerto Rico Environmental Quality Board (PREQB), and the United States Fish and Wildlife Service (USFWS). NAVFAC, USEPA, PREQB, and USFWS work jointly as the Vieques CERCLA Environmental Restoration Program (ERP) Technical Subcommittee. In addition, since UXO 16 includes the offshore areas of Vieques, this NTCRA includes coordination with the Puerto Rico Department of Natural and Environmental Resources (DNER), National Marine Fisheries Service (NMFS), and the National Oceanographic and Atmospheric Administration (NOAA).

This document was prepared following USEPA's guidance provided in document 540/R93/057 *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (USEPA, 1993). Submittal of this document fulfills the requirements for a NTCRA defined by CERCLA, Superfund Amendments and Reauthorization Act (SARA), and the National Oil and Hazardous Substance Pollution Contingency Plan (National Contingency Plan) (NCP). The document was prepared to ensure it contains the information pertinent to an EE/CA, but in a format that facilitates an expedited review process and allows for the expedited mitigation of the potential explosive hazard associated with the MEC/MPPEH items.

R:\USNAVFACENGCOM405450\VIEQUES\MAPFILES\UXO_16_AROUND_CAYO_LA_CHIVA_EECA\FIGURE 1-1 - REGIONAL LOCATION MAP.MXD CELEFTHERIADIS 2/5/2014 7:36:35 AM

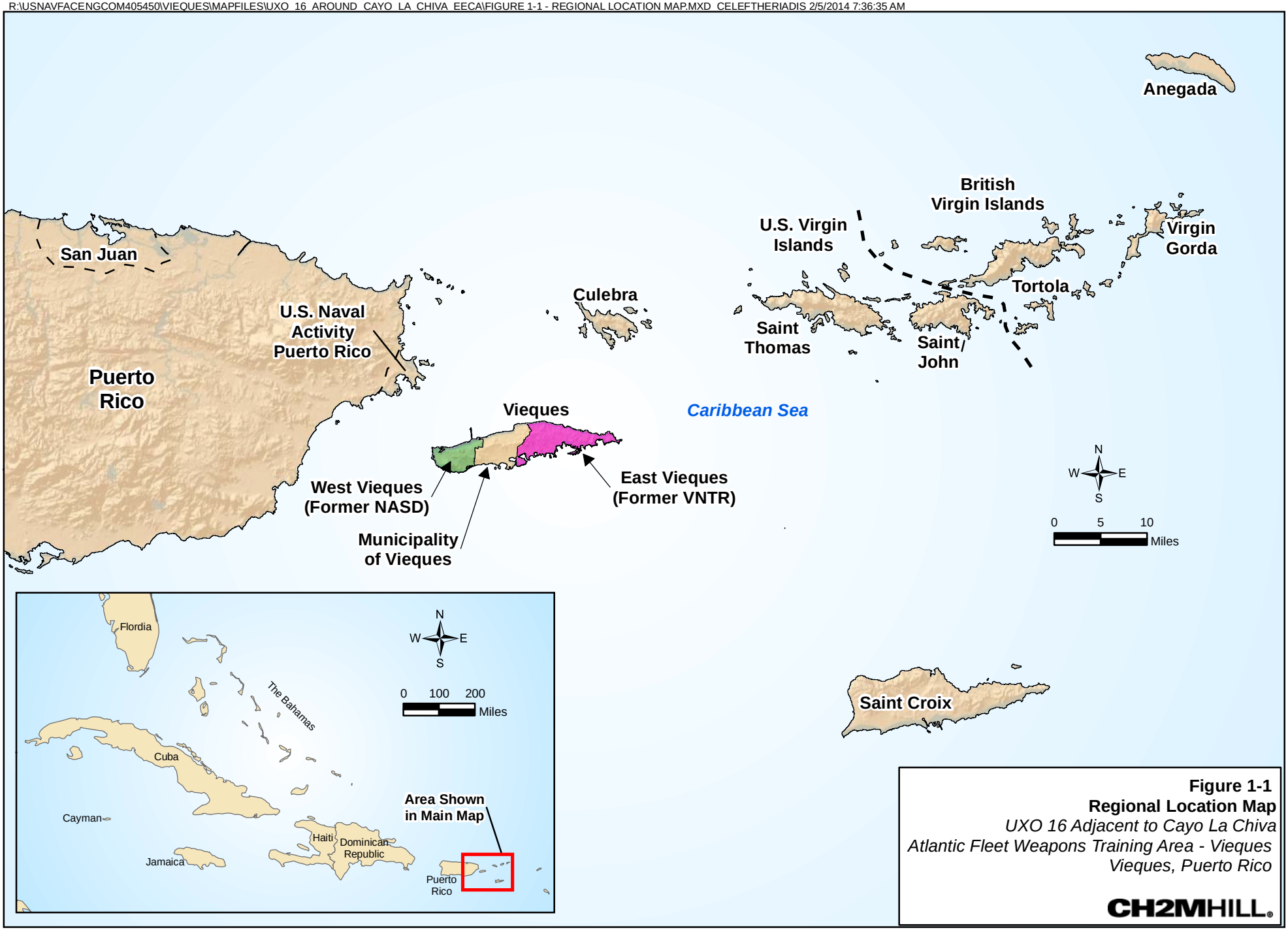

Figure 1-1
Regional Location Map
UXO 16 Adjacent to Cayo La Chiva
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

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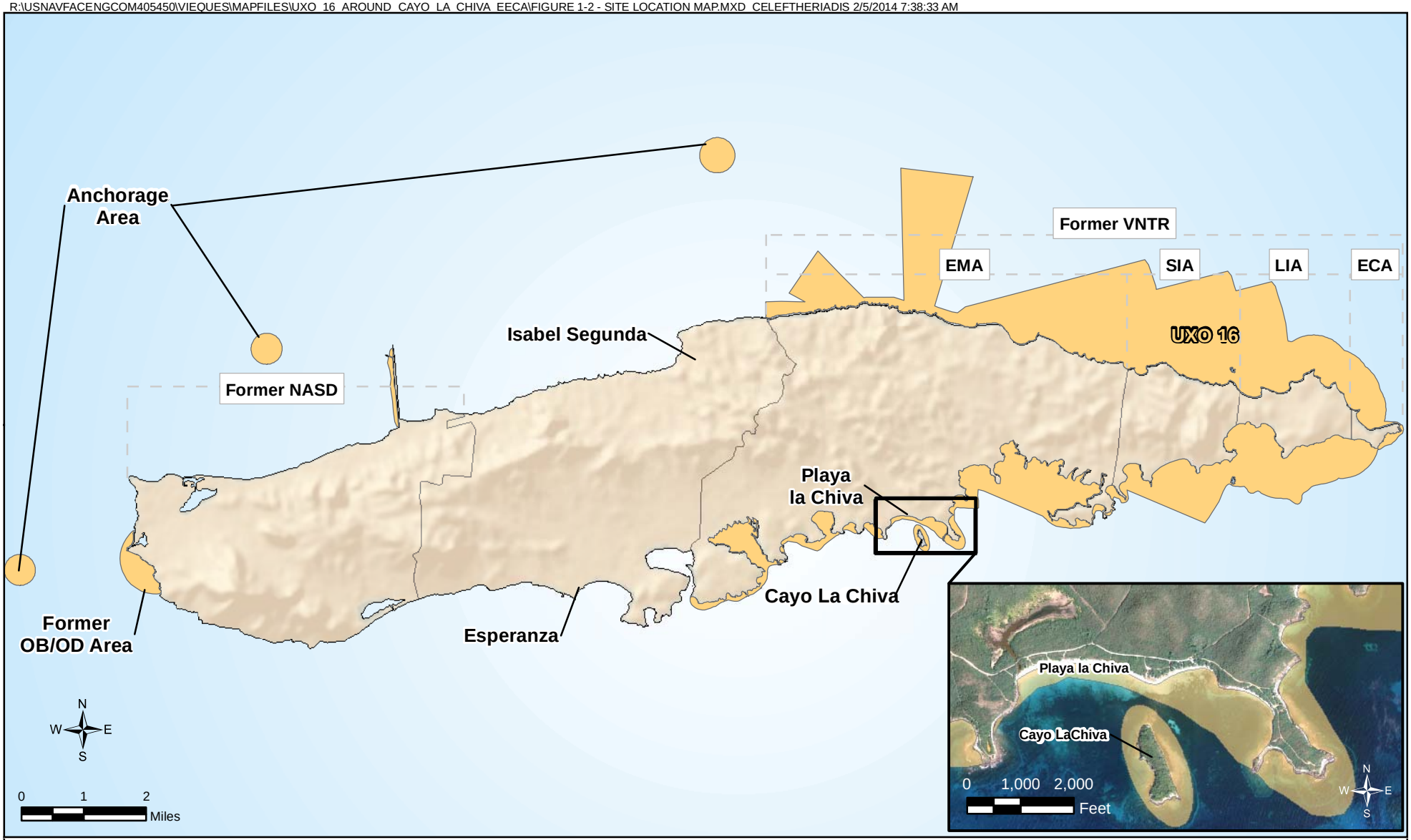
R:\USNAVFACENGCOM405450\VIEQUES\MAPFILES\UXO_16_AROUND_CAYO_LA_CHIVA_EECA\FIGURE 1-2 - SITE LOCATION MAP.MXD CELEFTHERIADIS 2/5/2014 7:38:33 AM



Legend

UXO 16

ECA - Eastern Conservation Area
EMA - Eastern Maneuver Area
LIA - Live Impact Area
SIA - Surface Impact Area
NASD - Naval Ammunition Support Detatchment
VNTR - Vieques Naval Training Range

Figure 1-2
UXO 16 Location Map
UXO 16 Adjacent to Cayo La Chiva
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

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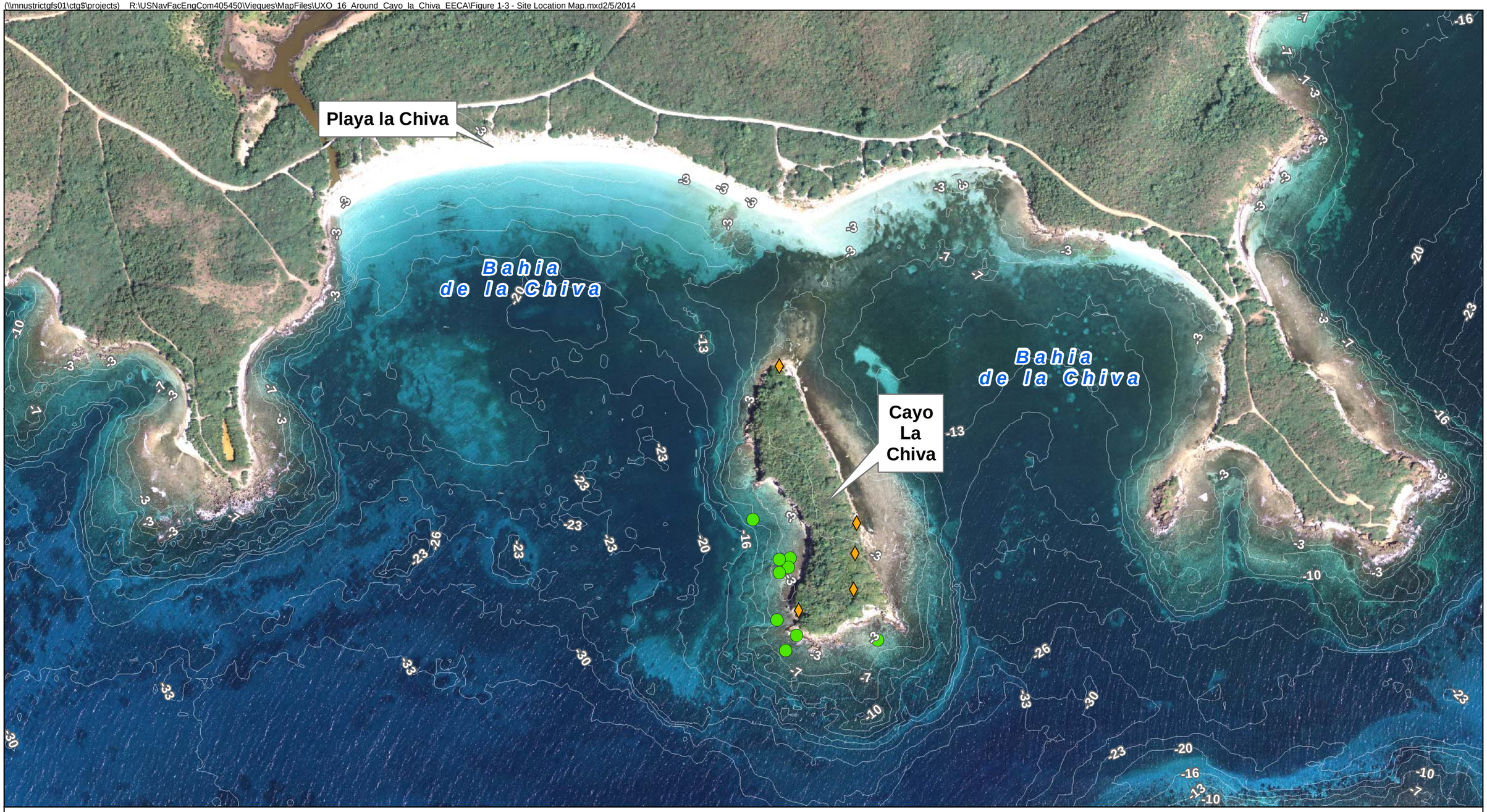
(\\mnustrictgfs01\ctg$\projects) R:\USNavFacEngCom405450\Vieques\MapFiles\UXO_16_Around_Cayo_la_Chiva_EECA\Figure 1-3 - Site Location Map.mxd2/5/2014



Legend

- Potential Underwater MEC/MPPEH
- MEC Identified on Land
- Bathymetry Contour - feet

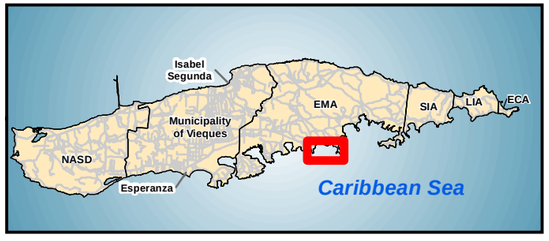


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Figure 1-3
Site Location Map
UXO 16 Adjacent to Cayo La Chiva
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

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SECTION 2

Site Characterization

2.1 Site Description and Background

- Vieques is located in the Caribbean Sea and is the largest offshore island of the Commonwealth of Puerto Rico; it is approximately 20 miles long and 4.5 miles wide (**Figure 1-1**).
- The Eastern Maneuver Area (EMA) was established in 1947 and provided maneuvering areas and ranges for the training by Marine amphibious units and battalion landing teams in exercises that included amphibious landings, small-arms fire, artillery and tank fire, shore fire control, and combat engineering tasks (**Figure 1-2**).
- Cayo La Chiva (UXO 18) is a 12-acre island south of the EMA. No historical training activities are documented for UXO 18; however, fired 5-inch rockets were identified both on and offshore of Cayo La Chiva, which indicates the area may have been used for live fire training (**Figures 1-2** and **1-3**). Warning signs were installed on Cayo La Chiva to deter access to the island.
- UXO 16 is approximately 11,500 acres in size and includes the underwater areas adjacent to the range and operational areas on East and West Vieques that are known or suspected to have been impacted by MEC (**Figure 1-2**). This NTCRA addresses only the nine potential MEC/MPPEH that were identified immediately offshore of Cayo La Chiva (**Figure 1-3**). Warning buoys were installed around Cayo La Chiva to deter use of the waters immediately adjacent to the island.
- The former VNTR was transferred to the Department of Interior (DOI) in 2003 to be operated and managed by the USFWS as a National Wildlife Refuge. The terrestrial areas are currently managed and protected as a wildlife refuge by USFWS and access to the restricted areas is discouraged by fences, landscape features (i.e., dense vegetation) and/or signage. The public currently has access to Bahia de la Chiva and Playa la Chiva (Blue Beach), which are popular destinations for recreational use, such as sunbathing, fishing, boating, swimming, snorkeling, and diving.

2.2 Physical Characteristics

- The circulation patterns in the Greater Antilles region are dominated by the westward-directed North Equatorial Current. Nearshore currents are variable, with flood and ebb tidal currents varying in speed and directions in different areas. These currents are also influenced by the prevailing northeasterly trade winds and tidal flow (Bauer et al., 2008).
- The tides of the Caribbean Sea are mostly mixed, with two unequal occurrences of high and low water in each tidal day. Some areas exhibit primarily semi-diurnal tides and other areas are dominated by diurnal tides (Nanal et al., 2012). At Isabel Segunda on the north side of the island, the mean tidal range is 0.25 m and the diurnal tide range is 0.38 m. Esperenza on the south side of Vieques exhibits a mean tidal range of 0.21 m and a diurnal range of 0.22 m.
- The south side of Vieques is characterized by numerous small inlets and lagoons, an east-west trending reef, and a relatively steep shelf slope drop-off toward the Caribbean Sea between 2 and 5 kilometers (km) from the shore line. In the area of the nine potential MEC/MPPEH, water depths are less than 13 ft deep (**Figure 1-3**). Water visibility in the area is generally clear, but can be affected by sea conditions.
- NOAA conducted benthic habitat mapping of the waters surrounding Vieques in 2009 (Bauer and Kendall, 2010). Seagrass and algae are the dominant biological cover types surrounding Cayo La Chiva, with coral making up 10-50% of the seafloor cover immediately west and south of the island (**Figures 2-1** and **2-2)**. The proximity of coral to the nine MEC/MPPEH items is not documented, but the potential association between the munitions and coral is accounted for in the alternatives evaluation and will be appropriately addressed as part of the interim action.

2.3 Previous Investigations and Nature and Extent of MEC Contamination

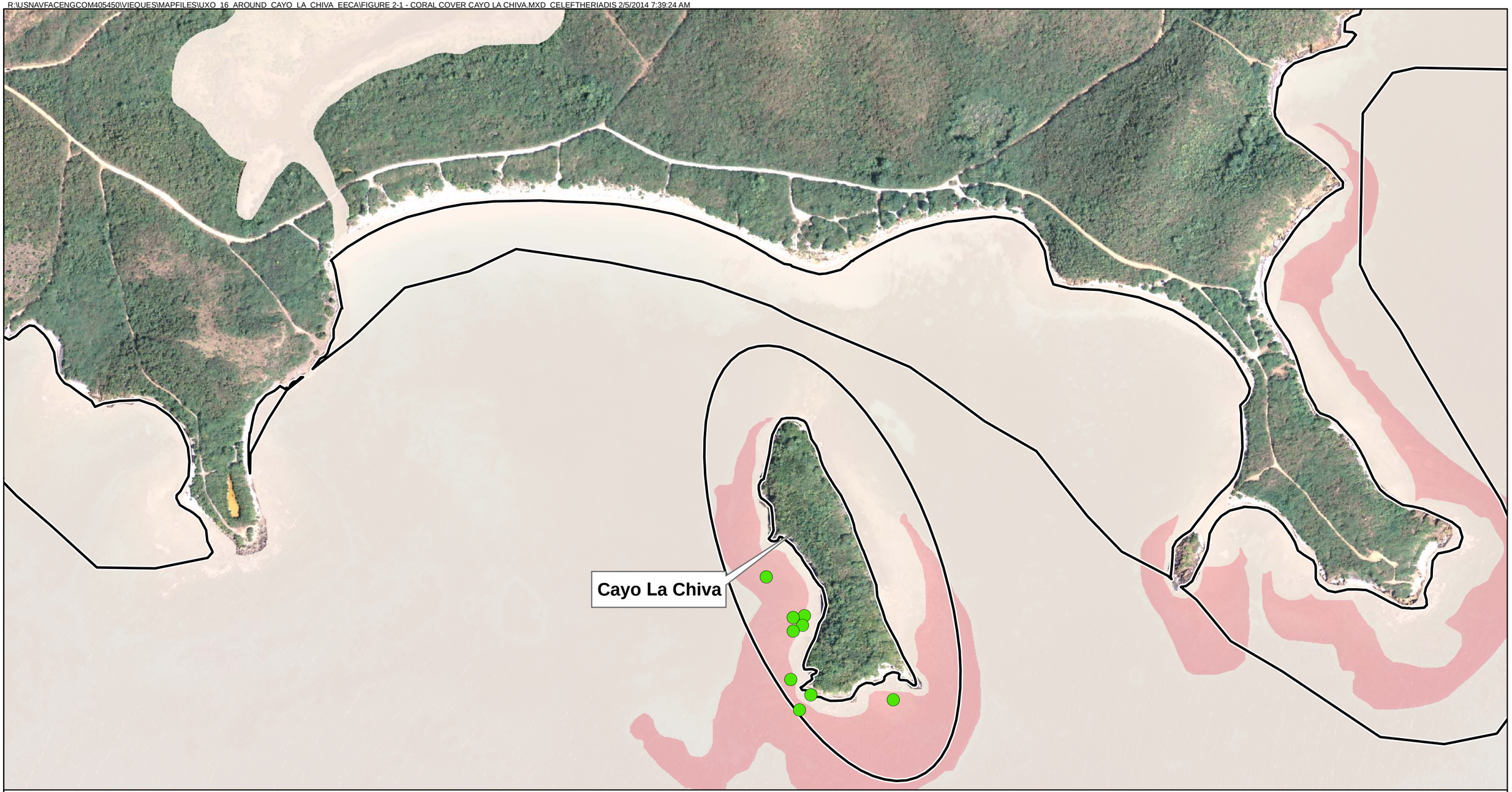
Several investigations have taken place in and around the NTCRA area. They are:

- In 2010, the Navy conducted a visual underwater survey using Navy Explosive Ordnance Disposal (EOD) divers/snorkelers to determine the presence of underwater MEC and MPPEH within Bahia de la Chiva (**Figure 2-3**). The underwater survey covered the entire area within 30 meters offshore of Cayo La Chiva (approximately 3 acres) and covered the remainder of the bay using 200-ft spacing transects. Nine potential MEC/MPPEH were identified just west and south of the island, five MEC items were identified as 5-inch rockets and four other as unidentified items.
- In 2011, a site inspection was conducted on Cayo La Chiva (UXO 18) to determine if MEC/MPPEH was present on the ground surface of the island. Transects covered approximately 5 percent of the island; five MEC (5-inch rockets) were identified and destroyed. In addition to MEC, range related debris (RRD) including smoke canisters were observed on the ground surface.
- In 2013, a surface and subsurface munitions investigation was completed at and immediately north of Blue Beach; one Discarded Military Munitions (DMM) item (projectile fuze) was identified on the far eastern end of Blue Beach, resulting in the closure of that stretch of the beach; several MEC/MPPEH were also found north of the beach including flares, bulk explosives, cartridges, BDU 33, and a practice mine (CH2M HILL, 2014).

2.4 Evaluation of Risk

- MEC/MPPEH pose a potential explosive hazard to potential human receptors within the NTCRA area, from activities such as swimming/snorkeling/diving, boating, and fishing. The potential explosive hazard presented by the MEC/MPPEH to ecological receptors is negligible; however, impacts of the NTCRA activities to threatened and endangered species, habitats, and sea life will be considered and mitigated as necessary, in accordance with the biological assessment and associated biological opinion.

R:\USNAVFACENGCOM405450\VIEQUES\MAPFILES\UXO_16_AROUND_CAYO_LA_CHIVA_EECA\FIGURE 2-1 - CORAL COVER CAYO LA CHIVA.MXD CELEFTHERIADIS 2/5/2014 7:39:24 AM



Legend

- Potential Underwater MEC/MPPEH
- UXO 16

Percent Coral Cover (Bauer and Kendall, 2008)

- 0% - <10%
- 10% - <50%

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Figure 2-1
Coral Cover - Cayo La Chiva
UXO 16 Adjacent to Cayo La Chiva
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

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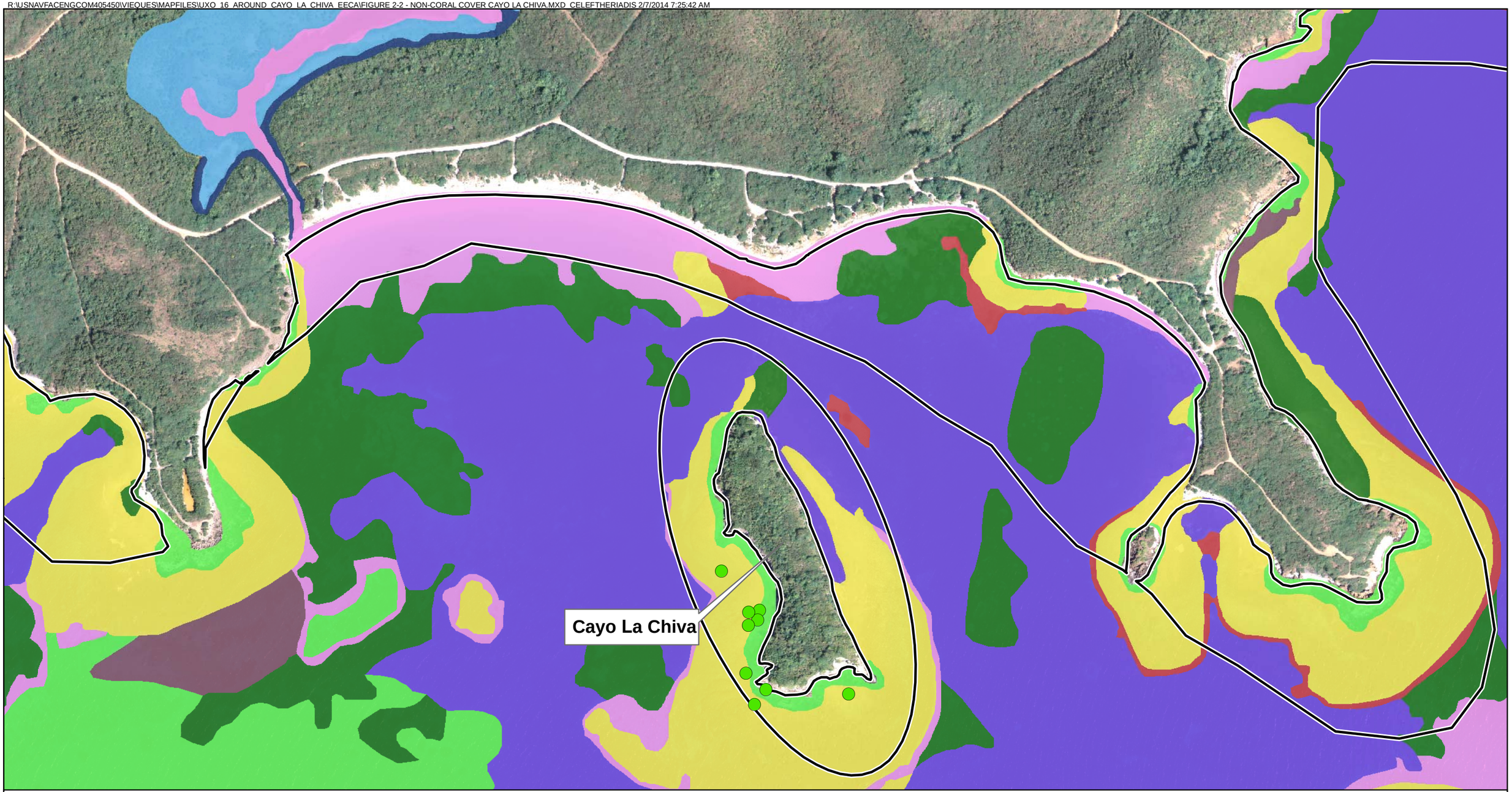
R:\USNAVFACENGCOM405450\VIEQUES\MAPFILES\UXO_16_AROUND_CAYO_LA_CHIVA_EECA\FIGURE 2-2 - NON-CORAL COVER CAYO LA CHIVA.MXD CELEFTHERIADIS 2/7/2014 7:25:42 AM



Legend

- Potential Underwater MEC/MPPEH
- UXO 16

Non-Coral Biological Cover (Bauer and Kendall, 2008)

- Algae 10% - <50%
- Algae 50% - <90%
- Algae 90% - 100%
- Mangrove 10% - <50%
- Mangrove 50% - <90%
- No Cover 90% - 100%
- Seagrass 10% - <50%
- Seagrass 50% - <90%
- Seagrass 90% - 100%
- Unknown

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0 500 1,000 Feet

Figure 2-2
Non-Coral Biological Cover - Cayo La Chiva
UXO 16 Adjacent to Cayo La Chiva
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

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(\\mnustrictgfs01\ctg$\projects) R:\USNavFacEngCom405450\Vieques\MapFiles\UXO_16_Around_Cayo_la_Chiva_EECA\Figure 2-3 - Underwater Visual Inspection Area.mxd2/7/2014

Legend

- Potential Underwater MEC/MPPEH
- Nearshore Survey
- Transect Inspections (approx. 200 ft spacing)

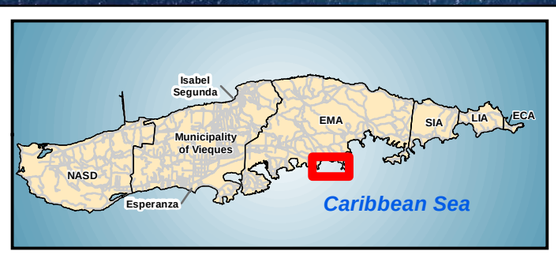

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Figure 2-3
Underwater Visual Inspection Areas
UXO 16 Adjacent to Cayo La Chiva
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

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SECTION 3

Removal Action Objectives and Scope

3.1 Statutory Limits on Removal Actions

This removal action will not be USEPA fund-financed. The Navy/Marine Corps Installation Restoration Program (IRP) Manual does not limit the cost or duration of the removal action; however, cost-effectiveness is a recommended criterion for the evaluation of removal action alternatives.

3.2 Applicable or Relevant and Appropriate Requirements

The selected removal action will comply with applicable or relevant and appropriate requirement (ARARs) under federal and Puerto Rico laws. **Appendix A** contains the ARAR tables and provides a summary of each potentially related environmental and munitions regulation. Other federal and Puerto Rico advisories, criteria, or guidance will be considered, as appropriate, in formulating the removal action.

3.3 Removal Action Objective and Scope

The goal of this EE/CA and subsequent interim removal action is to accelerate the process through which the explosive hazard associated with potential MEC/MPPEH is reduced while the site as a whole continues through the full CERCLA process. The site-specific removal action objectives (RAO) for this NTCRA is:

- Reduce the potential explosive hazard associated with nine potential MEC/MPPEH previously identified offshore of Cayo La Chiva.

3.4 Determination of Removal Action Schedule

The EE/CA will be placed in the Administrative Record and notice of its availability for public review along with a brief summary will be published in the local newspaper. The EE/CA will then be available for a 45-day public comment period. Following the public comment period, a Responsiveness Summary will be prepared that summarizes responses to significant comments that will also be included in the Administrative Record. Since this removal action has been designated non-time-critical, the start date will be initiated following the resolution of the comments.

The total project period is anticipated to require a few months, including preparation and implementation of the selected interim removal action. This is an estimated schedule for project completion and may vary depending on various factors including availability of materials and resources, weather and sea conditions, and the particular alternative implemented. Critical milestone periods related to the EE/CA are summarized below:

- EE/CA Public Comment Period—45 days
- Material procurement and site preparation—less than 1 month
- NTRCA — approximately 1-2 months

SECTION 4

Identification and Detailed Analysis of Removal Action Alternatives

4.1 Removal Action Alternatives Description

Based on the information provided in Section 2 and RAO presented in Section 3, the following removal action alternatives have been considered for detailed evaluation:

1. No Action
2. Combination of Recovery and Disposal, Blow-in-Place, and Encapsulation

A description of each of these alternatives is provided below. Other alternatives, such as water jetting or band saw cutting, were considered; however, since these alternatives have more significant safety issues associated with the MEC/MPPEH and are still considered developing technologies, they were not retained as alternatives for further evaluation. Similarly, an alternative consisting solely of Land Use Controls (LUCs) and Institutional Controls (ICs) was considered but not evaluated further because the Technical Subcommittee concurred that this alternative would not meet the RAO.

All alternatives (other than the No Action alternative) include a pre-NTCRA inspection using support boats and divers to evaluate the condition of the nine MEC/MPPEH previously identified by the Navy EOD divers near Cayo La Chiva (**Figure 2-3**). As possible, the unexploded ordnance (UXO) dive team will positively identify each item and its fuzing, determine whether movement of the item is safe, and will conduct a circle line search to inspect the seafloor in the immediate vicinity around each of the nine MEC/MPPEH with underwater metal detectors. In addition, prior to any removal activities, a biological assessment (or other process deemed appropriate by NMFS, USFWS, and/or DNER) will be conducted in the project area to determine what, if any, impacts there will be to sea life as a result of the NTCRA. The impact mitigation approaches identified in the biological assessment will be employed throughout the NTCRA.

4.1.1 Alternative 1—No Action

The no action alternative consists of leaving the site as it currently is, with no LUCs.

4.1.2 Alternative 2—Combination of Recovery and Disposal, Blow-in-Place, and Encapsulation

- This alternative assumes recovery and disposal, blow-in-place, and encapsulation will be considered for each item and that the most appropriate removal procedure for the item-specific condition will be selected. **Figure 4-1** provides the decision analysis process that would be employed to determine the optimal removal procedure for each item:
    - Recovery and disposal will be conducted for MEC/MPPEH that are safe to move. In accordance with NAVSEA OP5, for an item to be deemed “safe to move” the munitions response contactor’s senior UXO Supervisor and UXO Safety Officer must determine and document that “the risk associated with movement is acceptable and the movement is necessary for the efficiency of the activities being conducted or the protection of people, property or critical assets.” This determination will be made prior to moving or attempting to move the item (NAVSEA, 2011).

      If deemed safe to move, the item(s) will be manually removed, using hand tools if necessary, from its underwater location and moved to an area on land for destruction. The MEC/MPPEH will be floated to the water surface and towed to shore, where it will then be carried by hand to the disposal location. The items will be destroyed using the open detonation practices currently followed for the terrestrial munitions response activities on Vieques. Post-detonation sampling will be conducted at the demolition site following destruction of the item.

- Blow-in-place (BIP) will be performed on MEC/MPPEH that are determined unsafe to move and do not pose any adverse impacts to threatened or endangered species that cannot be mitigated in accordance with the biological assessment and associated biological opinion (as applicable). The MEC/MPPEH will be destroyed in place through open detonation using UXO divers and support boats. Following the demolition of the MEC/MPPEH, the area immediately around the demolition shots will be inspected to identify and remove readily visible metal fragments (i.e., those likely to be picked up by a recreational user).
- Encapsulation will be performed if the MEC/MPPEH are deemed unsafe to move and the potential damage to threatened and endangered species from BIP cannot be acceptably mitigated. For these items, the MEC/MPPEH will be encapsulated in place using UXO divers and support boats. For technical feasibility and cost-estimating purposes, it is assumed that encapsulation will be achieved using at least 6 inches of concrete placed around all exposed portions of the MEC/MPPEH in its existing condition/position. This thickness is sufficient to be protective from incidental contact. Once the concrete has set and properly cured, if necessary, live coral will be transplanted on the encapsulation. It is assumed that monitoring in place (UXO diver inspection of the encapsulation and existing warning buoys) will be conducted once a year for 30 years; however, these costs are excluded from the cost estimate associated with this action.

4.2 Analysis of Removal Action Alternatives

The alternatives were evaluated using the National Contingency Plan evaluation criteria (40CFR300.430(e)(9)). Evaluation summaries of the alternatives are presented in **Table 4-1**. Cost estimates of the removal alternatives are provided in **Table 4-2**, which is divided into the three methods (**Table 4-2a**, **Table 4-2b**, and **Table 4-2c**) to provide a range of costs associated with this alternative. For each of these sub-tables, the cost estimate for that action if applied to all nine MEC/MPPEH is shown. The alternative cost estimates are in 2014 dollars, based on RS Means and engineer's estimates for similar projects.

The cost estimates presented in **Table 4-2** have been developed strictly for comparing the removal alternatives. The final costs of the project and the resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, the implementation schedule, and other variables. Therefore, final project costs may vary from the cost estimates.

The cost estimates are order-of-magnitude estimates having an intended accuracy range of +50 to -30 percent. The range applies only to the alternatives as they are defined herein and does not account for changes in the scope of the alternatives.

TABLE 4-1

Detailed Evaluation of Removal Action Alternatives

UXO 16 Adjacent to Cayo La Chiva EE/CA
Atlantic Fleet Weapons Training Area—Vieques
Former Vieques Naval Training Range
Vieques, Puerto Rico

Evaluation Criteria	Alternative 1 No Action	Alternative 2 Combination of Recovery and Disposal, Blow-in-Place, and Encapsulation
Overall Protection to Human Health and the Environment		
Reduce explosive hazard associated with nine potential MEC/MPPEH previously identified offshore of Cayo La Chiva	Will not meet the RAO. No reduction in risk of exposure to MEC/MPPEH or the explosive hazard posed by the MEC/MPPEH.	This alternative will meet the RAO because it removes potential MEC/MPPEH or eliminates the exposure pathway for potential MEC/MPPEH in an area known to be used by recreational users.
Compliance with ARARs		
Location-specific ARARs	Complies with ARARs.	Complies with ARARs.
Action-specific ARARs	Not applicable.	Complies with ARARs.
Chemical-specific ARARs	Not applicable.	Complies with ARARs.
Long-Term Effectiveness and Permanence		
Magnitude of Residual Risks	No significant change in explosive hazard because no action would be taken; therefore, it is not effective or permanent.	Elimination of explosive hazard or elimination of exposure pathway.
Adequacy and Reliability of Controls	Access to the site is unrestricted.	Controls not necessary for items because they will be eliminated/encapsulated; existing warning buoys around Cayo La Chiva will be maintained
Reduction of Toxicity, Mobility, or Volume through Treatment		
Reduction of Toxicity, Mobility, or Volume through Treatment	No active treatment.	Reduction of MEC through disposal or reduction of mobility through encapsulation.
Short-Term Effectiveness		
Protection of workers during removal action	Not applicable.	MEC evaluation, destruction, and encapsulation would follow health and safety plan and procedures, including specialty training/procedures for underwater work.

TABLE 4-1

Detailed Evaluation of Removal Action Alternatives

UXO 16 Adjacent to Cayo La Chiva EE/CA
Atlantic Fleet Weapons Training Area—Vieques
Former Vieques Naval Training Range
Vieques, Puerto Rico

Evaluation Criteria	Alternative 1 No Action	Alternative 2 Combination of Recovery and Disposal, Blow-in-Place, and Encapsulation
Short-term risk that might be posed to the community during implementation	Not applicable.	The work is in a popular recreational area but the potential impacts to recreational users would be minimized through temporarily restricting access to the area as the NTCRA is completed. Potential impacts to the community while transporting the donor explosives to the items will be minimized by closing the beach area and using roads not open to the public and/or transportation by boat. Demolition of the items will take place while the beach and surrounding water areas are restricted to the public
Potential environmental impacts of remedial action and effectiveness and reliability of mitigation measures during implementation	Not applicable.	Potential significant impacts to the environment if the MEC/MPPEH is located on or adjacent to coral due to the likely damage/destruction of coral from underwater detonation. Temporary disturbance of the area immediately around the potential MEC/MPPEH items as the items are evaluated and removed or encapsulated. Mitigation measures will be implemented, as necessary, in accordance with the biological assessment.
Time until protection is achieved	Not applicable.	Approximately 2-3 months to complete destruction and/or encapsulation of MEC/MPPEH.
Implementability		
Technical feasibility	No action is technically feasible.	Services and materials are available; implementation of encapsulation more technically challenging than the responses that destroy the items.
Administrative feasibility	Agency approval unlikely.	Feasible (would require coordination with NMFS and DNER to protect marine species via biological assessment followed by a biological opinion as indicated by resources identified in the biological assessment).
Availability of services, equipment, and materials	Not applicable.	Available; would require delivery of donor charges and/or encapsulation materials.
Cost		
Cost (See **Table 4-2** for Cost Breakdown)	$0	$766,000 - $848,000 *

* Costs associated with long-term monitoring the encapsulation are not included in the remedial action. However, because selection of a particular alternative may include consideration of long-term monitoring costs, they are included in this footnote. The annual monitoring costs are estimated to be $6,000 per year, assuming on site resources (i.e., divers, equipment, vehicles, etc) can be used for monitoring. In addition, it is assumed that repairs to the encapsulation will be required once every five years at a cost of approximately $50,000 per repair event.

Table 4-2a

Alternative 2 - Recovery and Disposal Method

UXO 16 Adjacent to Cayo La Chiva EE/CA

Atlantic Fleet Weapons Training Area—Vieques

Former Vieques Naval Training Range

Vieques, Puerto Rico

Site: UXO 16 Near Cayo La Chiva, Former Vieques Naval Training Range — Base Year: 2014

Location: Vieques, Puerto Rico — Date: January 2014

Phase: EE/CA

Alternative Description:

- Pre-NTCRA evaluation of known underwater MEC/MPPEH
- Biological assessment of underwater area near known underwater MEC/MPPEH
- Removal of MEC/MPPEH (by hand) from underwater location near Cayo La Chiva to terrestrial disposal location

Description	Quantity	Unit	$/Unit	Total Cost	Notes
(1) Mobilization/Demobilization and Work Planning					
1.1 Work Plan	1	EA	$30,000	$30,000	Estimate
1.2 ESS Revision to Address Underwater Work	1	EA	$10,000	$10,000	Estimate
1.3 Dive Plan	1	EA	$15,000	$15,000	Cost based on previous costs incurred on CLEAN 8012 CTO 006
1.4 UXO Dive Team Mobilization (survey + removal)	2	EA	$13,200	$26,400	Cost based on previous costs incurred on CLEAN 8012 CTO 006
1.5 UXO Dive Team Demobilization (survey + removal)	2	EA	$13,200	$26,400	Cost based on previous costs incurred on CLEAN 8012 CTO 006
1.6 Biological Assessment of Underwater Area near Known MEC/MPPEH - Work Plan	1	EA	$30,000	$30,000	Cost based on FP for CLEAN 8012 CTO 006
1.7 Biological Assessment of Underwater Area near Known MEC/MPPEH - Fieldwork	1	LS	$43,458	$43,458	Cost based on previous costs incurred; Subcontract work on CLEAN 8012 CTO 006 in late 2011; $25,000 mobilization/demobilization; $5,315/day labor; daily rates escalated by 5% per year; estimate up to 3 days on site
1.8 Biological Assessment of Underwater Area near Known MEC/MPPEH - Reporting	1	EA	$35,000	$35,000	Cost based on previous costs incurred on CLEAN 8012 CTO 006
Subtotal 1				$216,258	
(2) MEC/MPPEH Location, Removal, and Destruction					
2.1 Reacquisition and Inspection of Previously Identified MEC/MPPEH by UXO Dive Team	1	Day	$20,000	$20,000	Cost based on previous costs incurred on CLEAN 8012 CTO 006
2.2 Retrieval of MEC/MPPEH by UXO Dive Team	9	Day	$20,000	$180,000	Assume 1 item can be recovered and transported to disposal site each day; 9 items total; 9 days; includes movement of MEC/MPPEH to terrestrial disposal location; Cost based on previous costs incurred on CLEAN 8012 CTO 006
2.3 Boat Support	19	Day	$1,300	$24,700	Assume 2 boats per day to support dive operation - one each for dive support and MEC/MPPEH towing; costs based on subcontract boat support costs incurred on CLEAN 8012 CTO 00014
2.4 Guards for Explosives Storage Magazine	3	Day	$325	$975	Assume up to 3 days of guard services needed based on delivery date of donor charges; costs based on subcontract security guard costs incurred on CLEAN 8012 CTO 00014
2.5 Demolition/Explosive Venting	1	Event	$11,160	$11,160	Assuming 1 event; Cost estimate is based on average demolition costs for USAE on VT004 through October 2013
2.6 Post-Demolition Sampling	1	EA	$3,925	$3,925	Soil sampling for explosives only; sample analysis cost $180/sample based on CH2M HILL Navy CLEAN lab BOA (no grinding/milling); estimated 10 samples per event; estimated $2,000/labor total including MEC avoidance support for day of sampling; estimated sampling materials $25/day; estimated sample shipping cost $100 ($50/cooler, assume 2 coolers)
Subtotal 2				$240,760	
Subtotal for Tasks 1 and 2				$457,018	
CONTINGENCY	20%		$457,018	$92,000	EPA July 2000 guidance
SUBTOTAL - CONSTRUCTION COST				**$550,000**	
(5) DESIGN&CM&PM					
Project Management	5%		$550,000	$27,500	EPA July 2000 guidance page 5-13
Construction Management	6%		$550,000	$33,000	EPA July 2000 guidance page 5-13
General&Administration (G&A)	9.2%		$550,000	$50,600	RSMeans 5% to 15%
Pollution Liability Insurance	2%		$550,000	$11,000	market price
Payment & Performance Bond	1.25%		$550,000	$6,875	market price
Fee	8%		$600,600	$48,048	
Tax	7%		$550,000	$38,500	Puerto Rico tax
TOTAL - Design &CM&PM				**$216,000**	
TOTAL Capital Cost				**$766,000**	

Assumptions:

Estimated total active construction period of 10 days for one UXO dive team

Assume 1 items can be recovered each day, for a total of 9 days of MEC/MPPEH demo

Note:

This estimate has been developed and provided as an Order of Magnitude Estimate (ROM)/Budgetary Estimate and as such is suitable for the purpose of budget development and/or planning only. This estimate is offered as an opinion of cost to perform the work and is not an offer to contract for construction services, procure and/or provide such services.

(Cost Accuracy Range: +50% / -30%)

Acronyms and Abbreviations

EA - each

LS - lump sum

Table 4-2b
Alternative 2 - Blow-in-Place Method
UXO 16 Adjacent to Cayo La Chiva EE/CA
Atlantic Fleet Weapons Training Area—Vieques
Former Vieques Naval Training Range
Vieques, Puerto Rico

Site: UXO 16 Near Cayo La Chiva, Former Vieques Naval Training Range
Location: Vieques, Puerto Rico
Phase: EE/CA
Base Year: 2014
Date: January 2014
Alternative Description:
- Pre-NTCRA evaluation of known underwater MEC/MPPEH
- Biological assessment of underwater area near known underwater MEC/MPPEH
- High Order Destruction of MEC/MPPEH in place
- Restoration of coral impacted through demolition of items, as necessary

Description	Quantity	Unit	$/Unit	Total Cost	Notes
(1) Mobilization/Demobilization and Work Planning					
1.1 Work Plan	1	EA	$30,000	$30,000	Estimate
1.2 ESS Revision to Address Underwater Work	1	EA	$10,000	$10,000	Estimate
1.3 Dive Plan	1	EA	$15,000	$15,000	Cost based on previous costs incurred on CLEAN 8012 CTO 006
1.4 UXO Dive Team Mobilization (survey + removal)	2	EA	$13,200	$26,400	Cost based on previous costs incurred on CLEAN 8012 CTO 006
1.5 UXO Dive Team Demobilization (survey + removal)	2	EA	$13,200	$26,400	Cost based on previous costs incurred on CLEAN 8012 CTO 006
1.6 Biological Assessment of Underwater Area near Known MEC/MPPEH - Work Plan	1	EA	$30,000	$30,000	Cost based on FP for CLEAN 8012 CTO 006
1.7 Biological Assessment of Underwater Area near Known MEC/MPPEH - Fieldwork	1	LS	$43,458	$43,458	Cost based on previous costs incurred; Subcontract work on CLEAN 8012 CTO 006 in late 2011; $25,000 mobilization/demobilization; $5,315/day labor; daily rates escalated by 5% per year; estimate up to 3 days on site
1.8 Biological Assessment of Underwater Area near Known MEC/MPPEH - Reporting	1	EA	$35,000	$35,000	Cost based on previous costs incurred on CLEAN 8012 CTO 006
Subtotal 1				$216,258	
(2) MEC/MPPEH Location and Destruction					
2.1 Reacquisition and Inspection of Previously Identified MEC/MPPEH by UXO Dive Team	1	Day	$20,000	$20,000	Cost based on previous costs incurred on CLEAN 8012 CTO 006
2.2 Destruction of MEC/MPPEH by UXO Dive Team	9	Day	$25,580	$230,220	Assume 1 item can be destroyed each day; 9 items total; 9 days; UXO dive team costs based on previous costs incurred on CLEAN 8012 CTO 006; demolition event estimate is based on average demolition costs for USAE on VT004 through October 2013 - costs are for terrestrial demolition but account of demo materials and oversight, assume 50% of demo costs required for additional labor and materials in addition to dive team
2.3 Boat Support	28	Day	$1,300	$36,400	Assume 3 boats per day to support dive operation - one each for dive team, demolition materials, and patrol to keep boaters out of bay; costs based on subcontract boat support costs incurred on CLEAN 8012 CTO 00014
2.4 Guards for Explosives Storage Magazine	10	Day	$325	$3,250	Assume up to 10 days of guard services needed based on delivery date of donor charges; costs based on subcontract security guard costs incurred on CLEAN 8012 CTO 00014
2.5 Restoration of Coral Impacted by Demolition Events	0.5	AC	$10,520	$5,260	Costs from *Coral Reef Restoration Handbook* (W. Precht, 2006) ($13,000 per hectare) and *Reef Restoration Concepts & Guidelines: Making sensible management choices in the face of uncertainty* (A. Edwards and E. Gomez, 2007) ($2,000 –13,000 per hectare) for low-tech transplantation; $13,000/hectare translates to $5,260/ac; cost escalated 200% to account for location costs; Assume 0.5 acres as conservative estimate for are requiring restoration.
Subtotal 2				$289,870	
Subtotal for Tasks 1 and 2				$506,128	
CONTINGENCY	20%		$506,128	$102,000	EPA July 2000 guidance
SUBTOTAL - CONSTRUCTION COST				**$609,000**	
(5) DESIGN&CM&PM					
Project Management	5%		$609,000	$30,450	EPA July 2000 guidance page 5-13
Construction Management	6%		$609,000	$36,540	EPA July 2000 guidance page 5-13
General&Administration (G&A)	9.2%		$609,000	$56,028	RSMeans 5% to 15%
Pollution Liability Insurance	2%		$609,000	$12,180	market price
Payment & Performance Bond	1.25%		$609,000	$7,613	market price
Fee	8%		$665,028	$53,202	
Tax	7%		$609,000	$42,630	Puerto Rico tax
TOTAL - Design &CM&PM				**$239,000**	
TOTAL Capital Cost				**$848,000**	

Assumptions:
Estimated total active construction period of 10 days for one UXO dive team
Assume 1 item can be destroyed each day, for a total of 9 days of MEC/MPPEH demo
Assume 0.5 acres as conservative estimate for are requiring coral transplantation/restoration

Note:
This estimate has been developed and provided as an Order of Magnitude Estimate (ROM)/Budgetary Estimate and as such is suitable for the purpose of budget development and/or planning only. This estimate is offered as an opinion of cost to perform the work and is not an offer to contract for construction services, procure and/or provide such services.
(Cost Accuracy Range: +50% / -30%)

Acronyms and Abbreviations
AC - acres
EA - each
LS - lump sum

Table 4-2c
Alternative 2 - Encapsulation Method
UXO 16 Adjacent to Cayo La Chiva EE/CA
Atlantic Fleet Weapons Training Area—Vieques
Former Vieques Naval Training Range
Vieques, Puerto Rico

Site: UXO 16 Near Cayo La Chiva, Former Vieques Naval Training Range
Location: Vieques, Puerto Rico
Phase: EE/CA
Base Year: 2014
Date: January 2014
Alternative Description:
- Pre-NTCRA evaluation of known underwater MEC/MPPEH
- Biological assessment of underwater area near known underwater MEC/MPPEH
- Encapsulation of MEC/MPPEH with concrete
- Establishment of coral on cement encasement, as necessary

Description	Quantity	Unit	$/Unit	Total Cost	Notes
(1) Mobilization/Demobilization and Work Planning					
1.1 Work Plan	1	EA	$30,000	$30,000	Estimate
1.2 ESS Revision to Address Underwater Work	1	EA	$10,000	$10,000	Estimate
1.3 Dive Plan	1	EA	$15,000	$15,000	Cost based on previous costs incurred on CLEAN 8012 CTO 006
1.4 UXO Dive Team Mobilization (survey + removal)	2	EA	$13,200	$26,400	Cost based on previous costs incurred on CLEAN 8012 CTO 006
1.5 UXO Dive Team Demobilization (survey + removal)	2	EA	$13,200	$26,400	Cost based on previous costs incurred on CLEAN 8012 CTO 006
1.6 Biological Assessment of Underwater Area near Known MEC/MPPEH - Work Plan	1	EA	$30,000	$30,000	Cost based on FP for CLEAN 8012 CTO 006
1.7 Biological Assessment of Underwater Area near Known MEC/MPPEH - Fieldwork	1	LS	$43,458	$43,458	Cost based on previous costs incurred; Subcontract work on CLEAN 8012 CTO 006 in late 2011; $25,000 mobilization/demobilization; $5,315/day labor; daily rates escalated by 5% per year; estimate up to 3 days on site
1.8 Biological Assessment of Underwater Area near Known MEC/MPPEH - Reporting	1	EA	$35,000	$35,000	Cost based on previous costs incurred on CLEAN 8012 CTO 006
Subtotal 1				$216,258	
(2) MEC/MPPEH Location and Encapsulation					
2.1 Reacquisition and Inspection of Previously Identified MEC/MPPEH by UXO Dive Team	1	Day	$20,000	$20,000	Cost based on previous costs incurred on CLEAN 8012 CTO 006
2.2 UXO Dive Team Labor During Encapsulation	9	Day	$20,000	$180,000	Assume 1 item can be encapsulated each day; 9 items total; 9 days; UXO dive team costs based on previous costs incurred on CLEAN 8012 CTO 006
2.3 Encapsulation Materials	9	EA	$186	$1,674	Assume encasement will be rectangular and nominal thickness of 6 inches; 5 in HVAR Mk 1 dimensions approximately 5 inch diameter, 6 ft long; encasement dimensions for worst case scenario (entire rocket sitting on sediment surface) 7 ft x 1.5 ft x 1.5 ft (approx. 16 ft^3); 4000 psi concrete; Estimated 36 bags of concrete per item; Cost from HomeDepot for 60lb Quikrete ($4.00/bag); 3 2x8x8 boards for form ($14/ea from HomeDepot); cost escalated 200% to account for location costs.
2.3 Boat Support	19	Day	$1,300	$24,700	Assume 2 boats per day to support dive operation - one each for dive team and encapsulation materials; costs based on subcontract boat support costs incurred on CLEAN 8012 CTO 00014
2.4 Coral Transplant on Concrete Encasement	0.5	AC	$10,520	$5,260	Costs from *Coral Reef Restoration Handbook* (W. Precht, 2006) ($13,000 per hectare) and *Reef Restoration Concepts & Guidelines: Making sensible management choices in the face of uncertainty* (A. Edwards and E. Gomez, 2007) ($2,000 –13,000 per hectare) for low-tech transplantation; $13,000/hectare translates to $5,260/ac; cost escalated 200% to account for location costs.
Subtotal 2				$231,634	
Subtotal for Tasks 1 and 2				$447,892	
CONTINGENCY	20%		$447,892	$90,000	EPA July 2000 guidance
SUBTOTAL - CONSTRUCTION COST				**$538,000**	
(5) DESIGN&CM&PM			$47,950		
Project Management	5%		$538,000	$26,900	EPA July 2000 guidance page 5-13
Construction Management	6%		$538,000	$32,280	EPA July 2000 guidance page 5-13
General&Administration (G&A)	9.2%		$538,000	$49,496	RSMeans 5% to 15%
Pollution Liability Insurance	2%		$538,000	$10,760	market price
Payment & Performance Bond	1.25%		$538,000	$6,725	market price
Fee	8%		$587,496	$47,000	
Tax	7%		$538,000	$37,660	Puerto Rico tax
TOTAL - Design &CM&PM				**$211,000**	
TOTAL Capital Cost				**$749,000**	

Assumptions:
Estimated total active construction period of 10 days for one UXO dive team
Assume 1 item can be encapsulated each day, for a total of 9 days
Assume encasement will be rectangular and nominal thickness of 6 inches
Assume 0.5 acres as conservative estimate for are requiring coral transplantation/restoration

Note:
1 - This estimate has been developed and provided as an Order of Magnitude Estimate (ROM)/Budgetary Estimate and as such is suitable for the purpose of budget development and/or planning only. This estimate is offered as an opinion of cost to perform the work and is not an offer to contract for construction services, procure and/or provide such services.
(Cost Accuracy Range: +50% / -30%)

2 - Costs associated with long-term monitoring the encapsulation are not included in the remedial action. However, because selection of a particular alternative may include consideration of long-term monitoring costs, they are included in this footnote. The annual monitoring costs are estimated to be $6,000 per year, assuming on site resources (i.e., divers, equipment, vehicles, etc.) can be used for monitoring. In addition, it is assumed that repairs to the encapsulation will be required once every five years at a cost of approximately $50,000 per repair event.

Acronyms and Abbreviations
AC - acres
EA - each
LS - lump sum

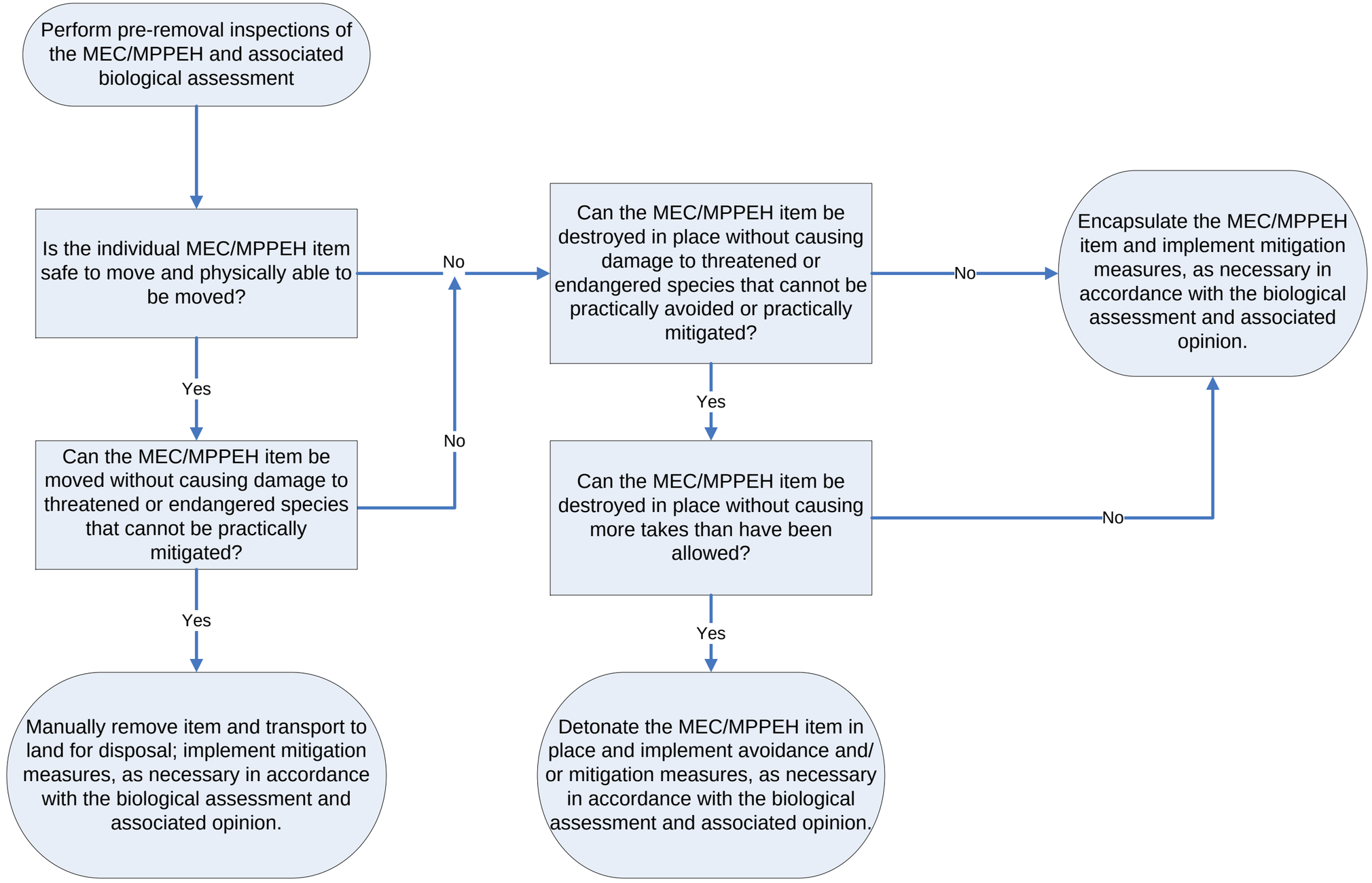

Figure 4-1
Alternative 2 - Interim Removal Action Decision Analysis
UXO 16 Adjacent to Cayo La Chiva EE/CA
Vieques, Puerto Rico

SECTION 5

Comparative Analysis of Removal Action Alternatives

A summary of the relative comparative analysis is provided in **Table 5-1.**

5.1 Overall Protection of Human Health and the Environment

- Alternative 2 is protective of human health and the environment because it will remove potential MEC/MPPEH (removal and disposal or BIP), or eliminate the potential exposure pathway to MEC/MPPEH (encapsulation).

5.2 Compliance with ARARs

- **Attachment A** presents a compilation and evaluation of state (Commonwealth) and federal chemical-specific, location-specific, and action-specific ARARs. All of the removal alternatives meet the ARARs.

5.3 Long-Term Effectiveness and Permanence

- Alternative 1 does not provide any long-term effectiveness.
- Alternative 2 provides long-term effectiveness through elimination of the explosive hazard or exposure pathway. Removing and disposal of the MEC/MPPEH or the BIPs provide an additional level of long-term effectiveness as all of the known MEC/MPPEH are no longer in place, whereas the encapsulation will break the exposure pathway but leave the items in place

5.4 Reduction of Toxicity, Mobility, and Volume through Treatment

- There is no reduction in toxicity, mobility, and volume associated with Alternative 1.
- Reduction of mobility and volume through treatment will be accomplished through Alternatives 2 by removal and destruction of MEC/MPPEH through detonation (either on land or BIP). However, in the event items are encapsulated, there will only be a reduction in mobility as the encapsulation will help ensure the MEC remains at its current location.

5.5 Short-Term Effectiveness

- Because there would be no physical removal activities associated with Alternative 1, it has the least short-term impacts.
- Alternative 2 will present potential short-term impacts to workers at the site and recreational site users, but these can be managed through MEC health and safety practices and, as applicable, enforcement of exclusion zones. Since the items are in a popular recreational area, short-term impacts to the general public will be the result of access restrictions to Playa La Chiva and the waters surrounding Cayo La Chiva during the implementation of the NTCRA.
- The following manageable safety concerns for workers will exist during the execution of the NTCRA:
  - Working in an area with potentially live munitions is the main hazard to workers associated with Alternative 2. All personnel involved with the removal actions will have the proper training and demonstrated experience for project roles and will receive site-specific training, including munitions awareness training (often referred to as Recognize, Retreat, Report [3R] Training) as appropriate. Exclusion zones will be maintained throughout the removal action and only authorized personnel will be allowed in the exclusion zone.

  - Because of the location for this NTCRA, Alternative 2 will result in workers spending extended periods of time underwater. Proper planning, training, equipment, and task- and site-appropriate personal protective equipment can mitigate the health and safety concerns associated with diving.

- Potential impacts to the environment are associated with the activities related to the evaluation, removal, destruction, and/or encapsulation of the potential MEC/MPPEH. Removing the MEC/MPPEH for terrestrial disposal or encapsulating them would have the least impacts to the environment. The BIPs may have significant impacts to the environment if the MEC/MPPEH is located adjacent to coral or seagreass due to the destruction of coral/seagrass from the detonation. To minimize these impacts, a biological assessment will be prepared for which a biological opinion will be issued.
- The timeframe to achieve the NTCRA RAOs is the anticipated duration of the NTCRA, which is a maximum of 2 to 3 months.

5.6 Implementability

- Since Alternative 1 is the No Action alternative and does not meet the RAOs, it would be difficult to obtain administrative approval for this alternative. Alternatives 2 is technically and administratively feasible. The potential damage to the coral and surrounding habitat may put constraints on the ability to conduct a BIP via Alternative 2; however, mitigation measures may be appropriate, which will be determined in the biological assessment, as applicable.

5.7 Cost

- Alternative 1 is the most cost effective as there is no cost associated with it; however, this alternative does not meet the RAO. The estimated cost of Alternative 2 anticipated to range from $766,000-$848,000.

TABLE 5-1

Comparative Analysis of Removal Alternatives

UXO 16 Adjacent to Cayo La Chiva EE/CA
Atlantic Fleet Weapons Training Area—Vieques
Former Vieques Naval Training Range
Vieques, Puerto Rico

Criterion	Alternative 1 No Action	Alternative 2 Combination of Recovery and Disposal, BIP, and Encapsulation
Threshold Criterion		
Overall protection of human health and the environment	✘	✓
Compliance with ARARs	✓	✓
Compliance with Chemical-Specific ARARs	Not Applicable	✓
Compliance with Action-Specific ARARs	Not Applicable	✓
Compliance with Location-Specific ARARs	✓	✓
Balancing Criterion		
Long-term effectiveness and permanence	○	●
Magnitude of Residual Risk	○	●
Adequacy and Reliability of Controls	○	●
Reduction of toxicity, mobility, or volume through treatment	○	●
Treatment Process Used and Materials Treated	○	●
Amount of Hazardous Materials Destroyed or Treated	○	●
Degree of Expected Reductions in Toxicity, Mobility, and Volume	○	●
Degree to Which Treatment is Irreversible	○	●
Type and Quantity of Residual Remaining After Treatment	○	●
Short-term effectiveness	◔	◔
Short-term Risks to Community During Removal Action	●	●
Short-term Risks to Workers During Removal Action	●	◔
Environmental Impacts	●	◔
Time Until Remedial Action Objectives are Achieved	○	●
Implementability	◒	●
Technical Feasibility	●	●
Administrative Feasibility	○	●
Availability of Services, Equipment, and Materials	Not Applicable	●
Cost (Total Present Value)	**$ -**	**$766,000 - $848,000 ***

Individual criterion scores: ○ not met ◔ poor ◒ satisfactory ◔ good ● excellent ✓ **criterion met**

* Costs associated with long-term monitoring the encapsulation are not included in the remedial action. However, because selection of a particular alternative may include consideration of long-term monitoring costs, they are included in this footnote. The annual monitoring costs are estimated to be $6,000 per year, assuming on site resources (i.e., divers, equipment, vehicles, etc) can be used for monitoring. In addition, it is assumed that repairs to the encapsulation will be required once every five years at a cost of approximately $50,000 per repair event.

SECTION 6

Recommended Interim Removal Action Alternative

Because the most appropriate removal procedure is based on the item-specific condition as well as its surroundings, it may not be feasible or appropriate to utilize a single removal procedure for all nine MEC/MPPEH. Item-specific evaluations of the MEC/MPPEH conditions and fuzing and a biological assessment of the area are needed to definitively identify the most appropriate removal option for each item. Therefore, Alternative 2 (Combination of Recovery and Disposal, Blow-in-Place, and Encapsulation) is the recommended removal alternative.

SECTION 7

References

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Appendix A
Applicable or Relevant and Appropriate Requirements

Table 1(a)
Federal Chemical-Specific ARARs
UXO 16 Adjacent to Cayo La Chiva EE/CA
Atlantic Fleet Weapons Training Area—Vieques
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

Media	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
No Federal Chemical-Specific ARARs apply.						

Table 1(b)
Puerto Rico Chemical-Specific ARARs
UXO 16 Adjacent to Cayo La Chiva EE/CA
Atlantic Fleet Weapons Training Area—Vieques
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

Media	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
Surface Water						
Surface Water	The protection of the uses assigned to the classifications of the coastal, surface, estuarine, wetlands, and ground waters of the Commonwealth of Puerto Rico.	Activity taking place in a coastal, surface, estuarine, wetlands, and ground waters of the Commonwealth of Puerto Rico.	Rule 1303C, 1303.1A, B, D, E, and H	2	Applicable	Applicable to surface water activities associated with removal, detonation, and/or encapsulating of items under investigation. However, none of the removal alternatives will cause degradation to the surrounding surface water.

Table 1(c)
Federal Location-Specific ARARs
UXO 16 Adjacent to Cayo La Chiva EE/CA
Atlantic Fleet Weapons Training Area—Vieques
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

Location	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
Coastal Zone						
Coastal zone or area that will affect the coastal zone	Federal activities must be consistent with, to the area that will affect maximum extent practicable, State coastal zone management programs. Federal agencies must supply the State with a consistency determination.	Activity taking place in a wetland, flood plain, estuary, beach, dune, barrier island, coral reef, and fish and wildlife and their habitat, within the coastal zone.	15 CFR 930.33(a)(1), (a)(2), (b); .35(a), (b); .36(a)	2	Applicable	Activities at UXO 16 that will affect Puerto Rico's coastal zone will be consistent to the maximum extent practicable with Puerto Rico's enforceable policies. Activities performed on-site and in compliance with CERCLA are not subject to administrative review; however, the substantive requirements of making a consistency determination will be met.
Migratory Flyway						
Migratory bird area	Protects almost all species of native birds in the United States from unregulated taking.	Presence of migratory birds.	16 USC 703	2	Applicable	The site is located in the Atlantic Americas Migratory Flyway. Any terrestrial-based consolidated detonations will be done in an area that will not destroy the birds, nests, or eggs.

Table 1(d)
Puerto Rico Location-Specific ARARs
UXO 16 Adjacent to Cayo La Chiva EE/CA
Atlantic Fleet Weapons Training Area—Vieques
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

Location	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
No Puerto Rico Location-Specific ARARs apply.						

Table 1(e)
Federal Action-Specific ARARs
UXO 16 Adjacent to Cayo La Chiva EE/CA
Atlantic Fleet Weapons Training Area—Vieques
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

Action	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
Placement of fill in surface water						
Discharge fill material	No discharge of fill material will be allowed unless appropriate and practicable steps are taken that minimize potential adverse impacts of the discharge on the aquatic ecosystem.	Discharges of fill material to surface waters, including wetlands.	40 CFR 230.10(d);	2	Applicable	In this case, the fill material is the encapsulation material for Alternative 4. Since this is an onsite CERCLA response action, the substantive requirements will be met, but a permit will not be required. If required a Compensatory Mitigation Plan will be prepared and compensatory mitigation will be performed.
Waste Management						
Management of non-hazardous solid waste onsite in containers or in piles.	Non-hazardous solid waste staged onsite must not create a hazard or public nuisance.	Generation of non-hazardous solid waste that is managed onsite in containers or in piles.	40 CFR 273.3-1(a); 3-3; 3-4(a); 3-7(a); 3-8(d)	2	Applicable	It is anticipated that non-hazardous solid wastes (i.e., material documented as safe [MDAS]) will be generated during the implementation of these alternatives. The MDAS will be managed as scrap metal.
Management of military munitions	Specifies management requirements for those military munitions that are no longer exempt from the definition of solid waste	Management of unused military munitions that have been disposed of or fired/used military munitions that have been removed from the range.	40 CFR 266.202(b) and (c) ; 205 (a) and (b)	2	Applicable	Munitions items discovered will be managed in accordance with OP-5 guidance.
Taking of protected species						
Underwater detonations	Actions that involve the incidental taking of threatened or endangered species or the destruction of the critical habitat of threatened or endangered species are generally prohibited.	The presence of threatened or endangered species and their critical habitat in an area where underwater detonations may result in incidential taking. Take means to harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any protected species.	16 USC 1538	2	Applicable	Several endangered species and critical habitats have been identified within UXO-16. Onsite CERCLA actions are exempt from permitting; endangered species will be addressed during project planning associated with the interim removal action.
Underwater detonations	Actions that involve the incidental taking of marine mammals are generally prohibited. Such actions are allowable only when it will have a negligible impact.	The presence of marine mammals in an area where underwater detonations may result in incidential taking. Take means to harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any protected species.	16 U.S.C. 1361	2	Applicable	The underwater destruction of munitions and explosives of concern may cause the incidental taking of marine mammals. Onsite CERCLA actions are exempt from permitting; protected species will be addressed during project planning associated with the interim removal action.

Table 1(f)
Puerto Rico Action-Specific ARARs
UXO 16 Adjacent to Cayo La Chiva EE/CA
Atlantic Fleet Weapons Training Area—Vieques
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

Action	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
Construction Activities						
Performing construction activities that generate noise	No construction activity may be performed at night or in such a way that vibrations are produced that can be felt beyond the property boundary. If equipment used in construction is not manufactured in accordance with USEPA standards for newly manufactured equipment then it may not produce noise that exceeds 70 dBA.	Construction activity including earthwork	Puerto Rico Regulation 3418.3.1.5(A),(C);3.1.10; 3.1.13; and 4.1	2	Applicable	The site is considered to be in Zone II (Commercial) for noise production. Noise pollution during MEC clearance and demolition, will be appropriately addressed.
Waste Management						
Management of non-hazardous solid waste onsite in containers and piles	Non-hazardous solid waste staged onsite must not create a hazard or public nuisance.	Generation of non-hazardous solid waste that is managed onsite in containers or in piles.	Puerto Rico Non-Hazardous Solid Waste Regulation 531.H	2	Applicable	It is anticipated that non-hazardous solid wastes (i.e., material documented as safe [MDAS]) will be generated during the implementation of these alternatives. The MDAS will be managed as scrap metal.